

RBW Comments on Red Hill Groundwater Modeling and Hydrogeologic Interpretations

2/15/18

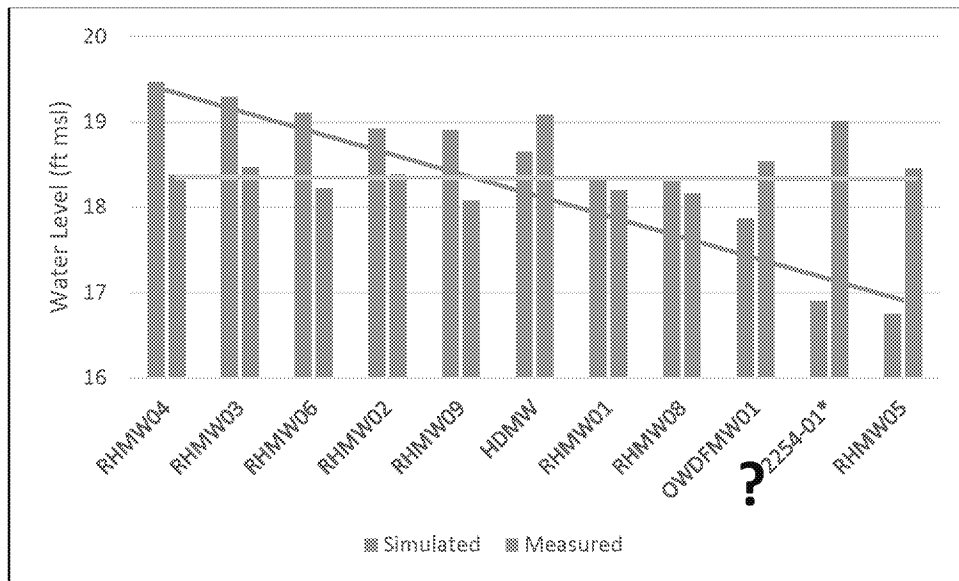
Don and I talk frequently and his input covers most of my concerns. I would like to focus one aspect that is critical to successful groundwater modeling and contaminant risk assessment. That is getting the modeled groundwater gradient in the area of concern to agree with the measured groundwater gradients. If the modeled groundwater gradient is inaccurate going down the Red Hill Ridge area, and inaccurate beneath the Red Hill Ridge relative to the Moanalua and Halawa areas, then the model serves no useful purpose. The key groundwater flow modeling question that needs to be answered is what is the magnitude and distribution of groundwater exchange between the Honolulu and Pearl Harbor Aquifers. This leads directly to assessing the risk the Facility poses to the Halawa Shaft. The boundary between these two aquifers runs right down the center line of the tank farm. This question is documented by item No. 11 in the "Groundwater Flow Model Working Group – ISSUES and ACTION ITEMS". The response to this question both written or responses has been "No issue: The boundary between these sectors is administrative, not hydrogeologic". For assessing risk to the Halawa Shaft it is the primary issue.

The hydraulic gradient down the axis of the Red Hill Ridge has been a topic of hot debate starting with Scoping Meetings in November 2015. During that meeting it was pointed out to the Navy's contractors that water level data collected during the monthly oil/water interface measurements showed no defined gradient in the mauka to makai direction. In spite of the evidence to the contrary, the Navy's contractor have persisted with the contention that groundwater flows down the axis of the Red Hill Ridge. Since the November 2015 scoping meetings a:

- Synoptic water level survey was done in November 2016, and
- The Top of Casing Elevations of the Red Hill Monitoring Network Wells have been surveyed to a common vertical datum.

A re-evaluation of the groundwater gradient beneath the Red Hill Ridge after each of these events confirms that there is no perceptible groundwater gradient in a flow path going down the Red Hill Ridge. The bar graph on the following page compares the modeled groundwater elevations (blue bars) to those measured in 2017 (orange bars). An eyeball estimate trend line is drawn for data set. The values for the modeled groundwater elevations were derived by applying the modeled residuals in Slide 30 to the average of water level measurements during the July and November rounds of groundwater sampling. For the modeled capture zone shown on Slide 55 to be valid there should be reasonable agreement between the trend in the modeled and measured groundwater elevations. Clearly this is not the case, so after an investment of tens of millions of dollars the resulting model is no better than that of Rotzoll and El-Kadi.

My assessment of the situation is that the Navy team, due to their lack of experience, is not qualified to do a groundwater evaluation that is on a regional scale. They seem to be very good at planning and executing field work and sampling, but fall far short of having the skills needed to do regional Hawaii hydrogeology.



The modeled groundwater elevations show a decreasing trend going from the upslope well, RHMW04 to the down slope wells, OWDFMW01, 2254-01, and RHMW05. The measured water levels show that there is no groundwater gradient trend going from RHMW04 to OWDFMW01. RHMW07 was excluded from this graph since it is a definite outlier and the drawdown during sampling shows poor connectivity to the larger aquifer. There is a question mark and an asterisk by the label for 2254-01, since the TOC reference point is uncertain and this is an actively pump shaft. Both conditions place in doubt how reflective the measured water level is in 2254-01 of the aquifer beneath the Red Hill Ridge.